DIE CASTING ENGINEER

December 1957

THE SOCIETY OF DIE CASTING ENGINEERS, INC.
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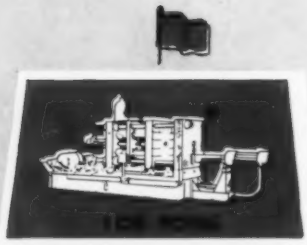
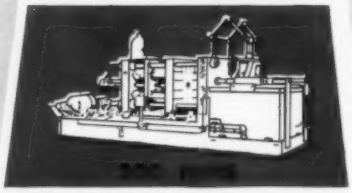
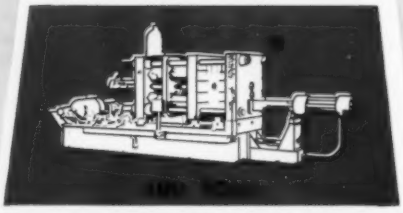


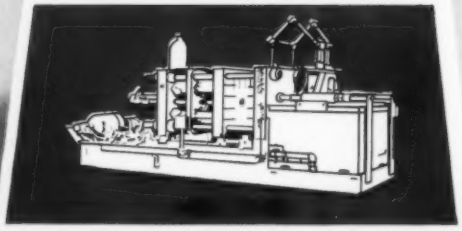
Tie Bar Centers: 16¾" x 14¾"
Tie Bar Dia.: 2½"
Die Plates: 4" x 20" x 22"



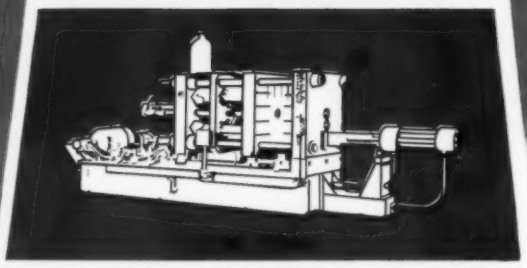
Tie Bar Centers: 22½" x 22½"
Tie Bar Dia.: 3½"
Die Plates: 5" x 29" x 31"



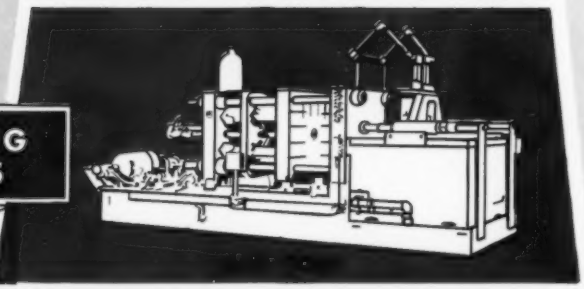
Tie Bar Centers: 28" x 24"
Tie Bar Dia.: 4"
Die Plates: 6" x 44" x 30"



Tie Bar Centers: 33" x 33"
Tie Bar Dia.: 5"
Die Plates: 7" x 46" x 44"



Tie Bar Centers: 36½" x 36½"
Tie Bar Dia.: 6"
Die Plates: 9" x 48" x 48"



Tie Bar Centers: 3
Tie Bar Dia.: 6½
Die Plates: 9" x 5

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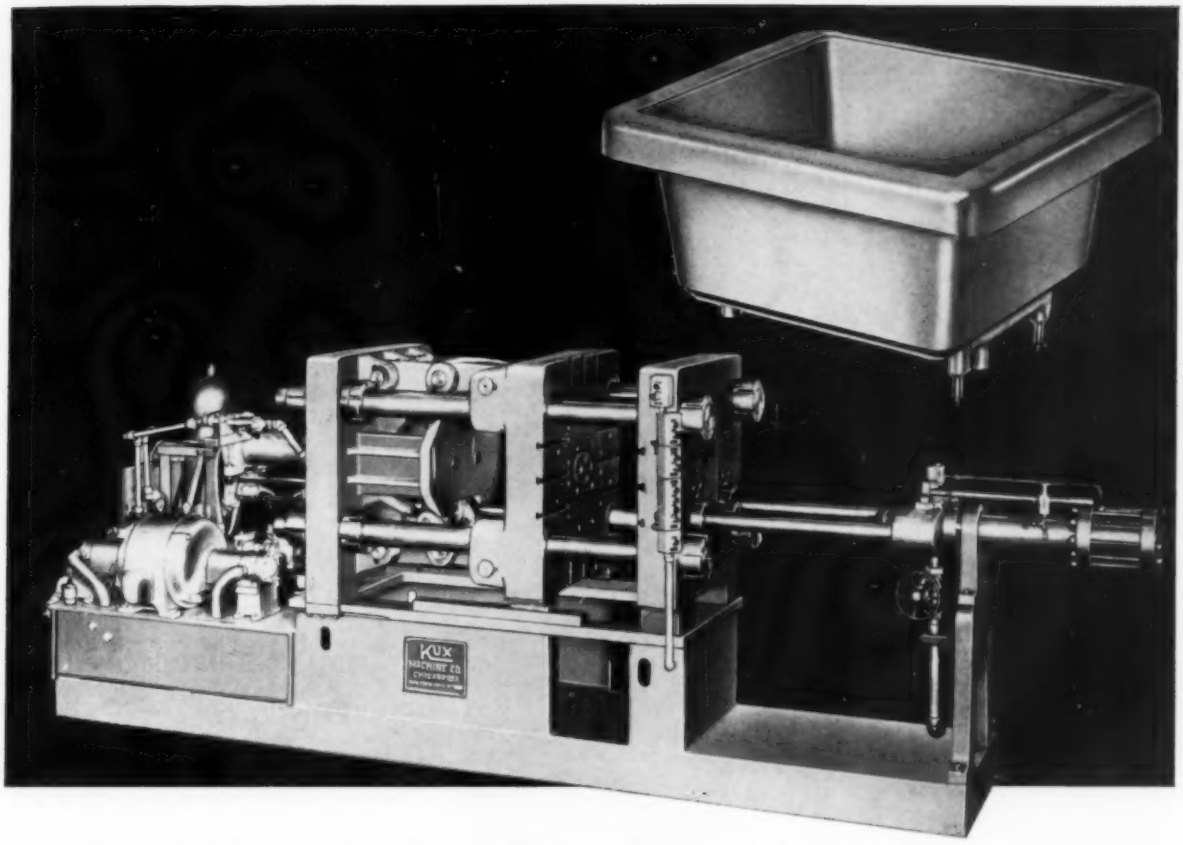

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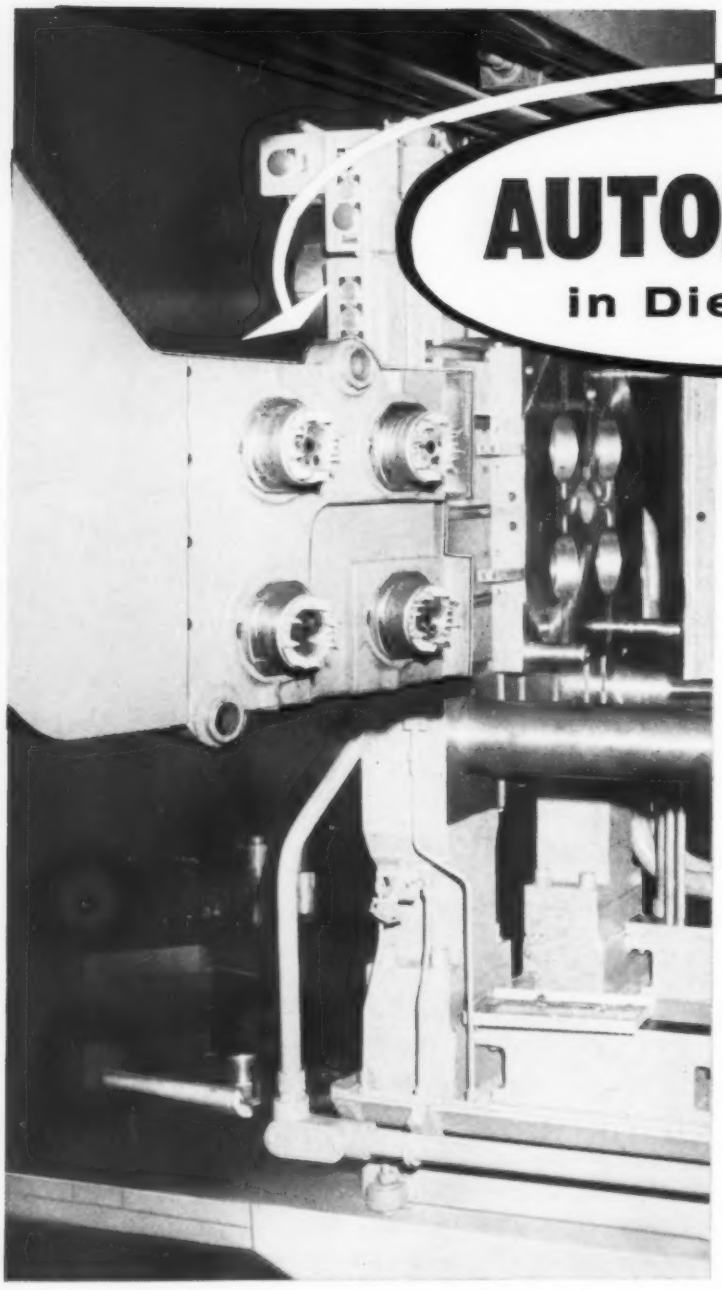

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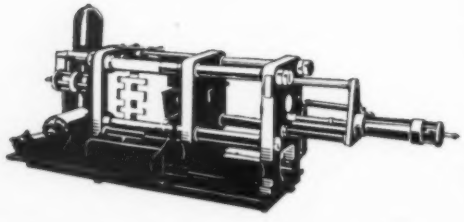

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DEPARTMENTS

COVER

The electrocleaning stage in an automatic barrel plating machine. Parts are loaded into the lucite barrel and cleaned in an alkaline solution. The barrel then moves automatically to a hot running rinse and other stages.

Photo courtesy Spectranome Plating Co., New York, N.Y.

The DIE CASTING ENGINEER is published quarterly by The Society of Die Casting Engineers, Inc.—a society for the improvement and dissemination of the knowledge of the arts and sciences of die casting, the finishing of metals, and the allied arts. The DIE CASTING ENGINEER offers a concentrated coverage of management and engineering in the die casting and directly related industries.

Only advertising pertaining to die casting and finishing of metals and the allied arts is acceptable. The Society reserves the right to reject any advertising deemed objectionable for any reason what-so-ever.

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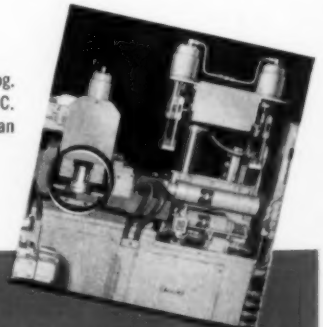

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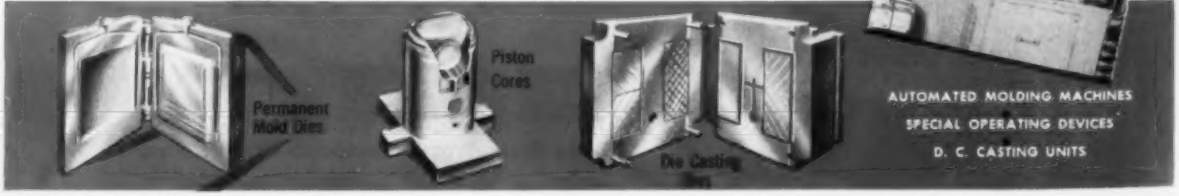

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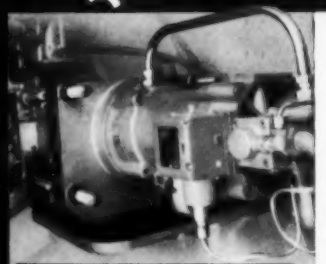

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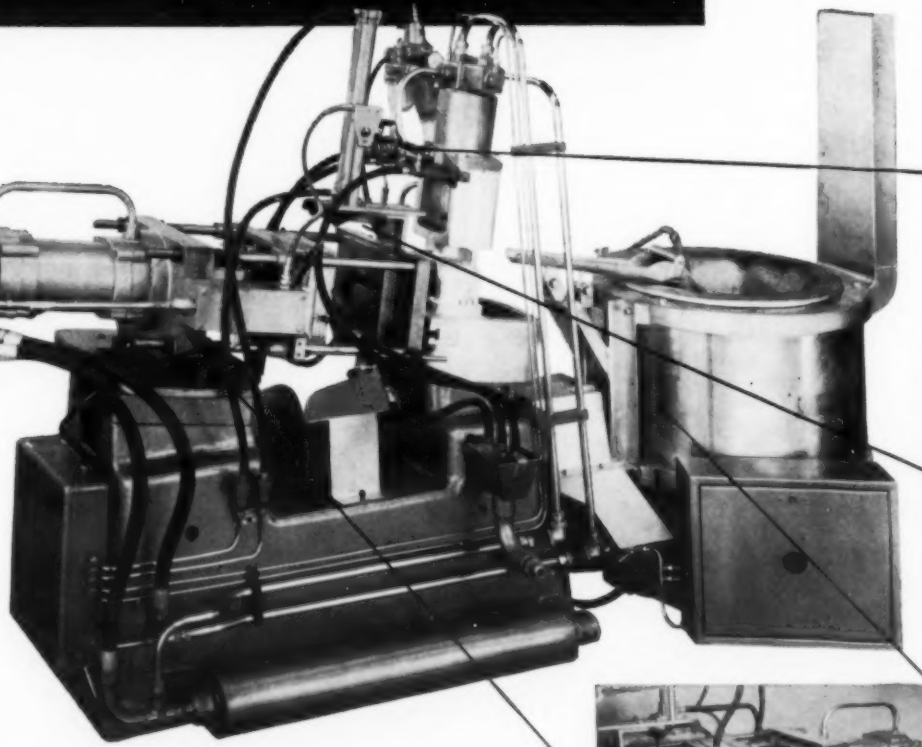

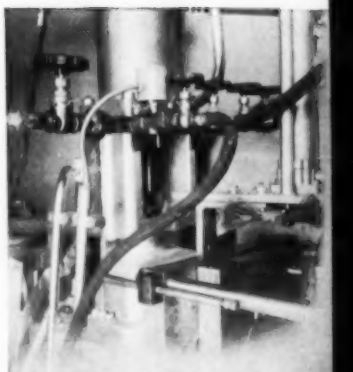

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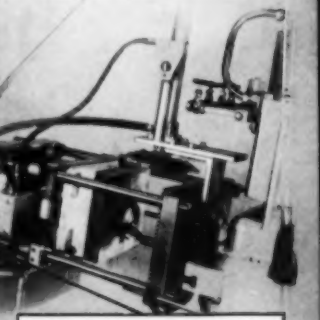

AUTOMATIC DIE CLEANING AND SELF-LUBRICATING MECHANISM. Tied into the machine cycle is a set of phosphor bronze brushes in adjustable segments to fit any die contour.

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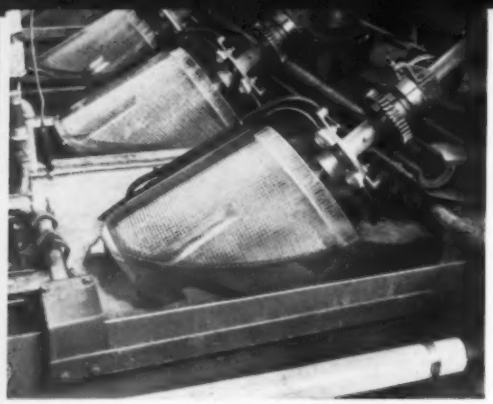


On the quality of the cleaning depends, in large measure, the quality of the plated or organic finish of any die casting. Cleaning before plating is the scope of the present article—a second, to be published in a forthcoming issue, will deal with prepaint conditioning.

Here are the methods of

DIE CASTINGS TO BE PLATED go through a variety of preceding operations—cutting down, polishing, buffing. In each of these, an abrasive or lubricant is used to facilitate the work or to protect the metal. In barrel finishing, for instance, such cutting down media as steel balls, aluminum oxide, silicon carbide, or silicon dioxide may be used to remove burrs and to polish the metal. In buffing operations, common compounds used are tripoli, lime, white polish, and red rouge, all of which contain certain vehicles, such as stearic acid, petrolatum, beeswax, tallow, tall oil, etc. Such compounds, while producing a smooth surface on the castings, also deposit soils. The soils themselves are compounded of the vehicle, chips of metal, the abrasive rouge or tripoli, particles from the buffing wheel, and shop dirt.

Often the compound used for buffing is the key to serious cleaning problems. An excess of the compound unnecessarily complicates the cleaning process, and intricately designed parts often carry hard-to-remove compound hidden in their recesses. Cleaning has often been simplified by changing the compound used in preceding operations. The nature of the deposit left on buffed castings is such that water will not dissolve it, and only a solvent will sufficiently dissolve the vehicle to permit removal of the other ingredients in the soil.

Degreasing is first step

Degreasing, then is the first step in cleaning before plating. Degreasing may be accomplished by soak tank cleaning, ultrasonic cleaning, or vapor degreasing. Each method has its uses; soak tank cleaning, pre-soaking the parts in an alkaline detergent solution or di-phase solvent, has the advantage in its economy for the usual run of work.

A typical alkaline soak would use a solution concentration of 3 to 4 ounces per gallon of water at 140 to 160°F for two to five minutes. Where soils are lighter and time for precleaning limited, alkaline solutions may also be applied through pressure spray machines.

Di-phase solvent soaking consists of placing the part in a solvent solution with a free oil top layer for about five minutes at a temperature of 160 to 180°F. As these temperatures exceed the flash point of the usual free oil top layer, it is recommended that the tank be enclosed in a tunnel equipped with an automatic carbon dioxide extinguishing system. This method is particularly effective on difficult soil removal problems, and is generally followed by alkaline spray cleaning and spray rinsing before electro-cleaning.

Precleaning permits the electrocleaning solution to do its job economically and with maximum effect. Precleaning itself is made considerably easier if it immediately follows the buffing or barrel burnishing operation, as then the compounds are fresh and have not had a chance to dry down on the surface.

The electrocleaning method is particularly efficient for precision work. Gas, generated at the cathode or anode, creates considerable turbulence near the soiled surfaces. This has the effect of scrubbing away deposits. Electrocleaning does the job in a matter of seconds, an important factor where high volume of production is essential to economic operation. Anodic cleaning, or reverse current cleaning, is usually preferred, as it does not plate out smut on the work.

The electrocleaner selected should give effective detergent action, speeding the emulsification, suspension, and removal of buffing compounds and other soils. It should be inhibited to prevent tarnishing (on brass and copper alloys) and harmful etching (on zinc and aluminum). High conductivity is desired, making more of the current available for cleaning action. It should rinse completely, leaving no surface scums or hard water soap films to cause water breaks in the subsequent acid dip. It should have satisfactory tolerance

by JOHN C. RUTTLE
Field Engineer
Oakite Products, Inc.

PRE-PLATE CLEANING

for your Die Castings

for chromic acid carried over from the plating operation back to the cleaning operation by the plating racks.

Zinc

Zinc electrocleaners should be inhibited against attack on the metal. They should not blacken the pieces. The cleaning should remove the causes of blistering and peeling, and minimize the hydrogen gas adsorption that might raise blisters when castings are heated after electroplating.

The following is a typical zinc electrocleaning cycle, subject to minor adaptations for manual, semi- or full automatic setups: Preclean. Clean with reverse current for 20 to 40 seconds in electrocleaning solution, 20 to 40 amperes per square foot, 6 volts. Solution concentration should be 3.5 to 4.5 ounces per gallon of water at 155 to 170°F. A cold running rinse, then a 10 to 30 second dip in sulphuric acid, 0.25% by volume at room temperature, follows.

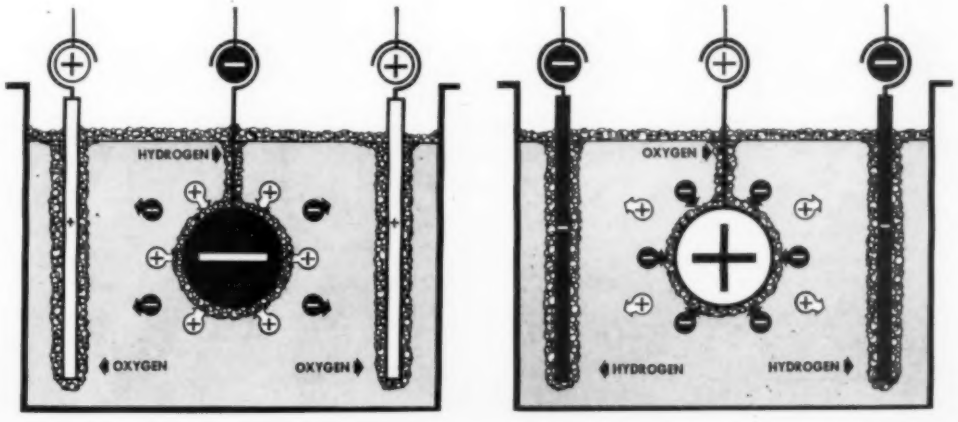
Copper

Careful control of concentration, temperature, current density, and time is essential in the electrocleaning of copper and its alloys. Otherwise, the bright buffed finish may be destroyed, and the etching resulting from attack on the surface will show through the plate. For these alloys soak-anodic cleaning in a specially designed detergent solution is recommended. Parts are soaked for two to five minutes, then reverse current cleaned for five to 30 seconds in the same solution. Heavy or dried on buffing compound residues may require special precleaning treatment.

Aluminum

Aluminum and its many alloys are cleaned before plating much in the manner of zinc, except that aluminum's characteristic oxide coating must be removed if plating is to adhere satisfactorily. "Zincating" replaces the oxide with a thin film of zinc, and is part of the cleaning procedure before plating these metals. Common practice is to preclean, then soak in an alkaline solution for one to three minutes at 160°F. Rinse, then dip in nitric or sulphuric acid (depending on the alloy) and rinse. Immerse in zinc dip for 0.5 to 1 minute at 60 to 80°F, and follow with two water rinses.

(*Continued on Page* 20)



Left—Direct current causes certain particles to "plate out" as smut on parts to be cleaned.

Right—Reverse current causes the positively charged, smut forming particles to move away from the parts to be cleaned.

Speed up your cold chamber operation with . . .

AUTOMATIC METERING of MAGNESIUM

by F. C. BENNETT and F. L. BURKETT
Metallurgical Engineers
The Dow Chemical Company

PROCESS CONVERSION ECONOMIES made possible by mechanization of the die casting process has stimulated the rapid growth of the Die Casting Industry. Essentially all zinc die castings are now produced on high speed, semi-automatic hot chamber die casting machines featuring automatic supply of the molten alloy. However, most of the higher melting temperature die casting alloys (aluminum, magnesium and brass) are still manually transferred to the machine by the relatively inefficient, costly and hazardous hand ladling operation which must be repeated for each cast. This manual ladling operation comprises a substantial portion of the operator movements and the casting cycle. When automatic metering is provided, as with the hot chamber machine, the operator can perform all his operations from one station at the die. In comparison with the hand ladling cold chamber operation, a significant increase in casting rate can be obtained with an automatic metering system.

Several difficult-to-control casting variables result from the hand ladling operation. Temperature of the metal deposited in the machine may fluctuate depending upon the ladle temperature and the time of transfer and pouring into the shot well. Temperature fluctuations often lead to a high percentage of poor quality or defective castings with consequent low casting efficiency. Also, as casting weight increases, operator fatigue becomes more acute, and for the largest shot weights considerable additional time must be allowed for the ladling operation or additional manpower must be assigned at extra expense.

A number of mechanisms have been devised for transferring molten metal from a furnace to a cold chamber die casting machine. Development work conducted by The Dow Chemical Company has indicated that mechanical valves employing metallic components offered the most favorable design for containing and controlling the feed of magnesium alloys to die casting machines. Magnesium is readily processed in steel equipment and has been melted and transferred in steel pots and pipes for many years.

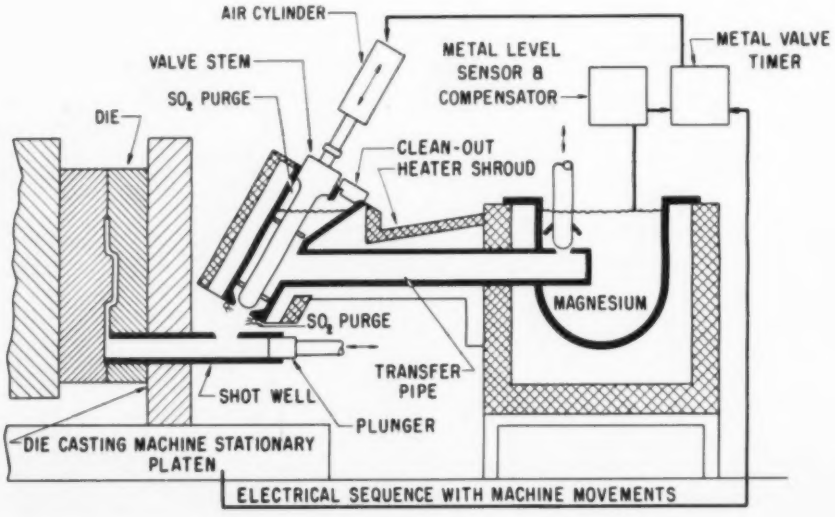


FIGURE 1

Schematic of automatic metering mechanism for magnesium cold chamber die casting.

A schematic drawing of the automatic feeding mechanism for magnesium is shown in Figure 1. Prepared molten magnesium alloy is charged to the gas or electrically heated steel holding pot. The molten metal is protected from oxidation by a conventional flux or a sulfur dioxide atmosphere. Molten magnesium from within the pot (thus avoiding dross inclusions) flows by gravity through a heated transfer pipe leading to a valve of special design immediately above the die casting machine shot well. The molten alloy seeks the same level in the valve standpipe as is maintained in the holding pot. The free surface of the molten metal in the valve standpipe and the atmosphere immediately adjacent to the valve outlet are purged with a small flow of sulfur dioxide gas to inhibit any oxidation of the exposed magnesium. The valve and transfer pipe are maintained at a controlled temperature with gas or electrical heat. Discharge of the metal for each cast is controlled by an electrical sequence wired into the die casting machine circuit so that when the operator presses the die close button, the machine closes the die, the automatic feed is energized to raise the metal valve stem for a timed interval to release a constant weight of metal, the machine shot plunger injects the metal into the die cavity, and following the die holding time the machine opens and ejects the casting. An automatic feeding mechanism is shown installed on a conventional cold chamber die casting machine in Figure 2.

The use of an automatic metering mechanism has permitted increasing casting rates to the cooling capacity of the dies. Since the actual metal pouring time is very small and follows immediately upon closing the die, the die holding time is the limiting factor. One multiple cavity shot of 1.55 pounds of magnesium has been cast at machine rates of 240 shots per hour, based on the actual time the operator is operating the machine. Tests of shorter duration showed that the part could be cast at a rate of 280 shots per hour until the die became overheated. Another multiple cavity die of one pound magnesium shot weight was cast at a peak rate of 350 shots per hour until the die overheated. The steady rate on this job was 270 shots per hour. A massive section multiple cavity part of 0.9 pound magnesium shot weight was cycled regularly at 225 shots per hour. A fourth small part of 0.3 pound shot weight was cast at a regular cycling rate of 330 shots per hour. In no experience to date has the maximum rate of this automatic metering mechanism been approached.

The quality of the magnesium die castings produced using automatic metering has been checked with visual, dimensional and radiographic procedures and compared with magnesium die castings produced by conventional methods. In no way was the surface appearance, quality, dimensions or corrosion of the parts impaired. In fact, by assuring uniform metal transfer conditions, the surface appearance and quality of the parts appeared to be improved.

As the operator no longer must move to the injection end of the machine to hand ladle metal into the shot well for each cast, his operating movements are considerably reduced and are now very similar to those for a hot chamber die casting machine operator. Lubricant is added to the die during the die closing portion of the machine cycle by an automatic lubricator of conventional design. The lubricator injects into the shot well just the correct small amount of lubricant required for magnesium alloys. At the start and finish of each shift the operator removes such dross as may have formed in the valve standpipe along with the customary pot or furnace maintenance.

(Continued on Page 22)

FIGURE 2

Automatic metering mechanism in operation on a conventional cold chamber die casting machine.

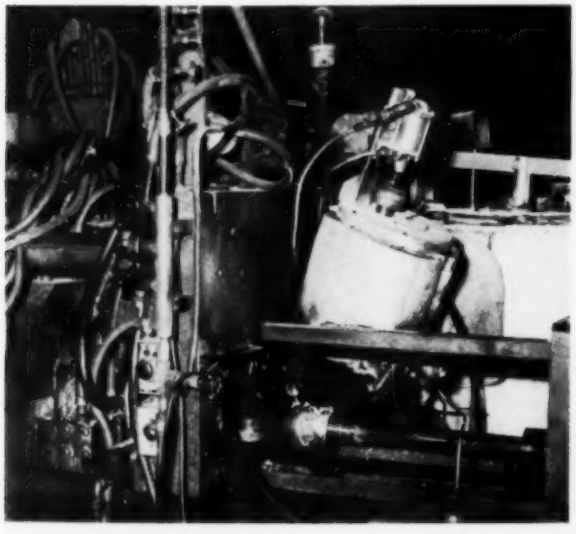
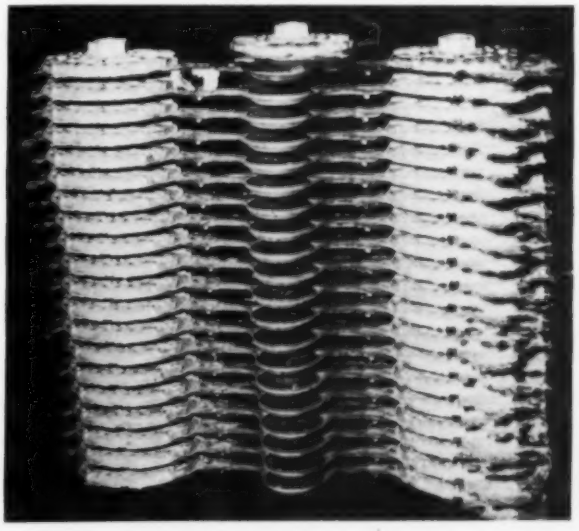
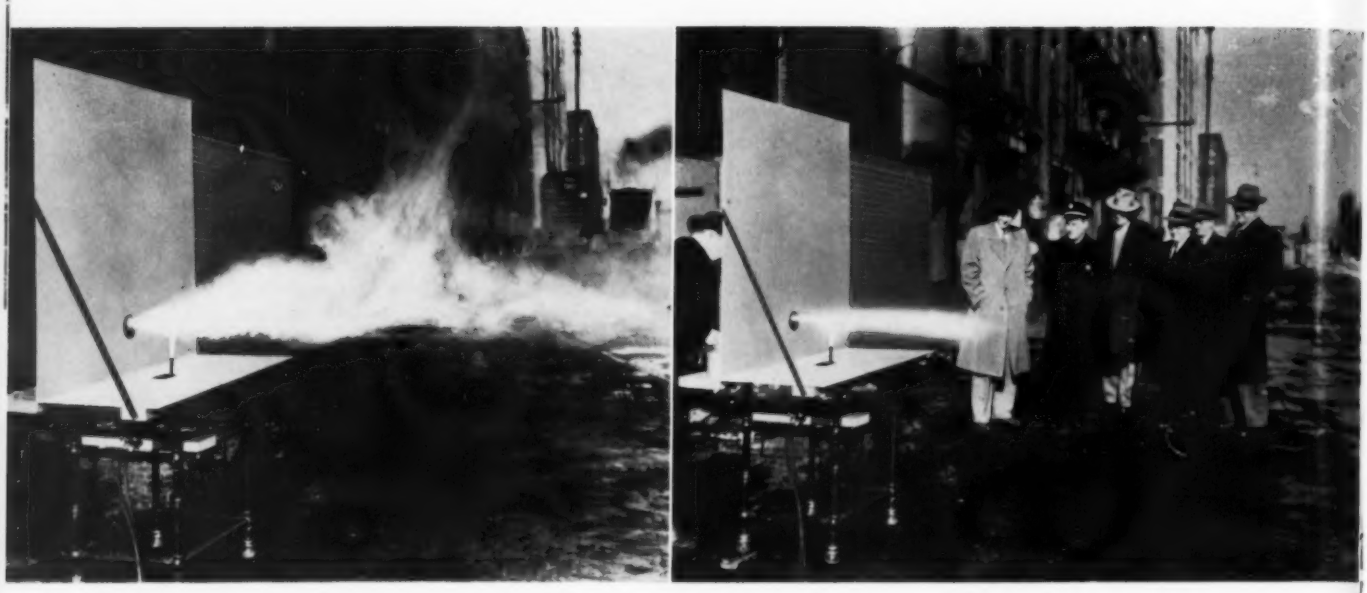


FIGURE 3

Successive shots of automatically-metered magnesium die castings. Note the uniform lengths of the biscuits.





Not this . . . . . But this

FIRE RESISTANT HYDRAULIC FLUIDS

by JOHN MATHE

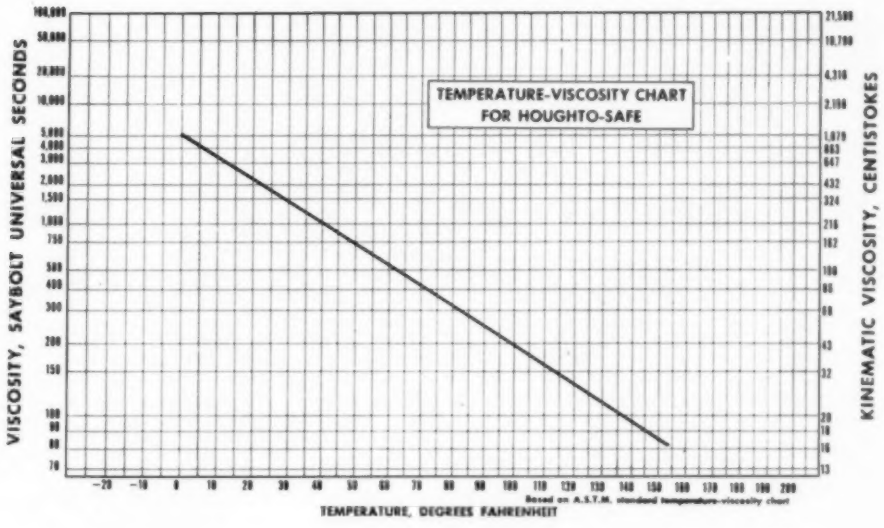
Lubrication Engineer
E. F. Houghton & Co.

FIRE RESISTANT HYDRAULIC FLUIDS are meeting with outstanding success in the protection of personnel, property and production through the elimination of the potential fire hazard of spilled petroleum base fluids. These new fire resistant hydraulic fluids provide the high film strength, high lubricity, stability and non-corrosiveness of the conventional petroleum base hydraulic fluids plus the added feature of fire resistance.

The potential fire hazard of flammable hydraulic fluids is readily apparent in the Die Casting Industry. Molten metal and gas fired furnaces provide the heat of ignition of the fluid, making a ruptured high pressure hydraulic line a veritable flame thrower. Because the operator stands close to the hydraulic lines of his die casting machine, a safety problem is also involved.

Elimination of this fire hazard is as simple as eliminating the cause of the fire, the flammable petroleum base hydraulic fluid, and replacing it with a fire resistant fluid. The investment required to convert existing hydraulic equipment to fire resistant fluid may be as little as the cost involved in purchasing new fluid, or at most the cost involved in replacing the existing rubber gaskets, packing and seals in addition to the fluid. In all cases adequate cleaning of the system is a necessary part of the proper fluid change-over procedure. This investment can be easily justified in the light of the loss that might be incurred as the result of a fire caused by a broken hydraulic line.

Fire resistant hydraulic fluids are available in aqueous, synthetic and emulsion types. The aqueous fluids consist essentially of water, ethylene glycol, and a high viscosity lubricant and thickening agent plus selected additives. They do not attack conventional packings, and they are completely stable in use and storage. The aqueous fluids are best suited for most hydraulic applications where the operating temperature does not exceed 130°F. Above this temperature



A typical Temperature-Viscosity plot for an aqueous type, fire resistant hydraulic fluid.

the rapid evaporation of water from the fluid presents the problem of maintaining the proper concentration of the fluid. Conventional paints are not compatible with aqueous fluids, and special coatings are required where the fluid comes in contact with painted surfaces. Aqueous fluids provide the highest efficiency for the lowest installed cost in most systems.

The synthetic hydraulic fluids find their major applications where the operating temperature exceeds 130°F. Composed of solutions of esters in organic solvents, the synthetic fluids present some conversion problems in conventional hydraulic equipment. These fluids may attack some packing and hose materials. Polysulfide rubber, impregnated leather or butyl rubber are recommended. Special paints are required where the fluid comes in contact with painted surfaces.

Synthetic fluids offer good corrosion resistance, and they are completely stable in use and storage. Although this type of fluid is not fire proof, its high ignition temperature compared to petroleum base fluids makes it quite fire resistant.

The emulsion type hydraulic fluids are basically water containing small amounts of insoluble oils. These oils form a true emulsion to provide the desired viscosity, lubricity and corrosion resistance. Emulsions are stable in both use and storage, and very fire resistant. Applications of this type of fluid are similar to those of the aqueous type, i.e., where the operating temperature does not exceed 130°F. However, the corrosion resistance and lubricity of the emulsified fluids are not as great as those of the aqueous fluids; thus, the emulsion type hydraulic fluids find limited use.

Safety in the Die Casting Industry leaves something to be desired. In your efforts to eliminate unsafe conditions in the operation of your die casting machines, a long first step may be taken by reducing the fire hazard with one of the fire resistant hydraulic fluids now available. ■ ■ ■

This ¾" hydraulic line burst and sprayed a fire resistant hydraulic fluid into molten aluminum at 1200°F. There was no fire and the unit was quickly put back into production.

Fire resistant hydraulic fluid is a safety precaution in die casting shops, where hydraulic equipment operates close to gas fired furnaces and molten metal.

Chapter

1 DETROIT and

Meetings: First Tuesday of the Month

Officers for 1957-1958

Chairman:	Richard P. Baribault, Aluminum Company of America, 610 New Center Bldg., Detroit 2, Mich.
Vice Chairman:	Louis Pedicini, Process Development Section, General Motors Corp.
Secretary-Treasurer:	Ollie Clayton, Permanent Mold Die Co. Inc.
Librarian & Historian:	Sam Donabedian, Samson Design Service
Trustee—Three year:	Duncan Hannah, Die Cast Die Designs
Trustee—Two year:	Richard P. Sullivan, Jr., Detroit Mold Engineering Co.
Trustee—One year:	Armand Millier, Nu-Engineering Inc.

2 SAGINAW VALLEY

The last three meetings at Devon Gables have been extremely well attended and the speakers were outstanding.

In October, Mr. Irwin Lubalin, General Manager of the Shaw Process Development Corporation, spoke on PRECISION CASTING THE 5% CHROMIUM DIE STEEL FOR THE DIE CASTING INDUSTRY. Nomination of officers took place at this meeting.

Mr. J. Howard Dunn, Chairman of the Alcoa Cleveland Development Division, was speaker at the November meeting. His talk, entitled THE DIE IS CAST, outlined the past, present, and future of aluminum die casting. Mr. Dunn was assisted by Mr. James Smith of the Alcoa Automotive Engines Division.

The December meeting at Devon Gables featured a talk on DIE CAST DIE STEELS by Mr. C. T. Fletcher, Research Metallurgist, Braeburn Alloy Steel Division. Mr. Fletcher discussed the development of hot work die steels, heat treatment and die failures. He also described his findings regarding the properties of these steels.

3 WESTERN MICHIGAN

Meetings: Second Tuesday of the month, Schnitzelbank Restaurant

Officers for 1957-1958

Chairman:	Carl H. Neuendorf, Keeler Brass
Vice Chairman:	Charles E. Laitsch, Grand Rapids Brass
Secretary-Treasurer:	Leslie W. Haisen, Vickers, Inc.

Western Michigan Chapter meetings are well attended and the officers are pushing their membership drive very nicely.

The October meeting featured a talk on AUTOMOTIVE ORNAMENTATION by Mr. R. A. Brauburger of Chrysler Corporation Central Engineering. This talk was supplemented by colored slides.

Mr. John G. Thomas, Tool Steel Supervisor for Crucible Steel Co. in the New York area, addressed the November meeting. His topic was DIE STEELS AND THEIR USE IN THE DIE CASTING INDUSTRY.

A joint meeting with the American Electroplaters Society was held on December 10th. Mr. A. K. Unterkofler of Ternsted Division of G.M. addressed the group. His talk was entitled EVOLUTION OF DIE CASTING.

4 TOLEDO

Meetings: Second Tuesday of the month

Officers for 1957-1958

Chairman:	Wesley Wight, Chevrolet Transmission Div.
Vice Chairman:	Charles Hodan, Ford Motor—Sandusky
Secretary-Treasurer:	T. E. Hansen, E. F. Houghton & Co.
Librarian & Historian:	Paul Phillips, Chevrolet Transmission Div.
Trustees:	Roland Fulton, Chevrolet Transmission Div.
	George Hodgson, Doehler-Jarvis-Toledo
	John Preas, Latrobe Steel

Mr. George Shippereit of Battelle Memorial Institute discussed CASTING TITANIUM at the October meeting.

In November, Mr. Alfred Sugar of Castmaster spoke on DIE CASTING IN GENERAL.

The December meeting of the chapter was held at Lynn's Restaurant. This was a business meeting and social get-together.

The January meeting is scheduled for Angelo's Spaghetti House. The speaker is to be announced.

5 CHICAGO

Meetings: First Thursday of the month

Officers for 1957-1958

Chairman:	W. D. Johnson, Bell & Howell
Vice Chairman:	R. A. Wunderlich, Dormeyer Corp.
Secretary-Treasurer:	Warren Vorman, Vorman Tool & Die
Librarian & Historian:	John Kohler, Sunbeam Corp.
Trustees:	Ray Dunn, U.S. Reduction
	Al Prickett, Western Electric
	Robert Draven, U.S. Reduction
	Joe Schmidt, Lester Engineering
	D. R. Edgerton, Lindberg Steel Treating

Both the November and December meetings were held at Nielsen's Restaurant in Chicago. The meetings were well attended and growth of the chapter looks promising.

Dr. Richard B. Saltonstall of Udylite Corporation spoke on PLATING OF ZINC DIE CASTINGS at the November meeting.

The December meeting, in true holiday spirit, was devoted to social gabbing. No speaker was scheduled.

News

6 CLEVELAND

Meetings: Third Tuesday of the month

Officers for 1958

Chairman:	Arnold Williams, Cleveland Hardware & Forging Co.
Vice Chairman:	David M. Morgenstern, Nelmor Manufacturing Corp.
Secretary-Treasurer:	Robert D. Black, Rex Oil & Chemical Co.
Trustees:	Fred Neumann, Conneaut Die Casting Co.
	John Hilfinger, Luster Corp.
	Harry Cagin, The Halex Die Casting Co.
	James W. Christopher, Tool-Die Engineering Co.
	David J. Sloane, Lester-Phoenix, Inc.

The November meeting featured a talk on DIE CASTING DIES by Mr. George J. Schad of Carpenter Steel Company. The meeting was held at the West Side Turn-Verein.

No meeting was scheduled for December but in January, Mr. David Morgenstern of Nelmor Manufacturing Company will speak. His subject will be ZINC AND ALUMINUM VACUUM DIE CASTING. The January meeting is to be held at the West Side Turn-Verein.

7 NEW YORK

Meetings: Third Thursday of the month

Officers for 1957-1958

Chairman:	Joseph Elkins, J. R. Elkins Inc.
Vice Chairman:	Frank Massino, Watchugg Die Casting Co.
Secretary-Treasurer:	Ed Mannerberg, Premier Die Casting Co.
Librarian-Historian:	Ed Arnao, Advance Pressure Castings, Inc.
Chairman of Trustees:	John Thomas, Crucible Steel Co.
Trustee—2 year:	Ted Kerekes, Columbia Engineering Co.
Trustee—3 year:	Bill Vach, Dollin Corp.

The October meeting, at the Hotel Governor Clinton, was opened by Theodore J. Kerekas. Harris R. Shimel, member of the national Board of Directors of the SDCE, was present to help with the first election of officers. The above listed officers were elected and the 1957-1958 year was off to a good start.

The Hotel Governor Clinton was also the site of the November meeting. This meeting featured a talk by Mr. Irwin Lubalin, General Manager of Shaw Process Development Corporation, entitled PRECISION CASTING THE 5% CHROMIUM DIE STEEL FOR THE DIE CASTING INDUSTRY.

18 NEW ENGLAND

Meetings: Third Wednesday of the month

The first official meeting of the New England Chapter took place on November 20th at Hickory House, Worcester, Massachusetts. The following officers were duly elected:

Chairman:	Francis E. Kennedy, Kennedy Die Castings, Inc.
Vice Chairman:	Patrick James Hughes II, General Electric Company
Secretary-Treasurer:	A. R. McIntyre, Reed-Prentice Corp.
Librarian & Historian:	Milton Harmon, Cast-Master, Inc.
Chairman of Trustees:	E. W. Brix, Hampden Brass & Aluminum Co.
Trustee—3 year:	A. J. Moore, R. E. Phelon, Inc.
Trustee—2 year:	W. Bosyck, Westinghouse Electric & Mfg. Co.

Mr. Edmond Day of American Charcoal Company was guest speaker at the November meeting.

No meeting is scheduled for December. The next meeting is scheduled for January 15th. Mr. Irwin Lubalin will speak at this meeting.

New England is off to a fine start with interest and membership growing steadily.

25 INDIANA

Harry E. Erickson and Dean Rockwell were present at the formal opening of the Indianapolis Chapter on November 21st. The meeting was held at Linders Restaurant in Anderson, Indiana. Officers appointed are as follows:

Chairman:	Donald Sutherland, G.M. Guide Lamp Division
Vice Chairman:	John Fischer, Chrysler Casting Plant, Chrysler Corp.
Secretary:	James A. Poat, Delco-Remy Division, G.M. Corp.
Treasurer:	Glen Boxwell, Delco Radio Division of G.M.

The speaker at this opening meeting was Mr. Birger Johnson, Metallurgical Engineer for Latrobe Steel Corporation.

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Casting Around

by THEODORA SIMONEAU

A RECENT SURVEY conducted by the SDCE of our leading universities, colleges and technical institutes on the teaching of die casting pointed out in an alarming manner how little is being done. I had mentioned in a previous article that the University of Minnesota did not offer the course, nor any other of the schools I had contacted. After reading Mr. Zurbrick's article I contacted men in the Die Casting Industry asking opinions and reasons for this lack of formal training. The following are a few of the replies I received:

1. Our schools, through lack of cooperation with each other, have failed those who would like to learn the art of die casting. If one school would teach the course, allowing students from other schools to attend and receive credit, there would be a sufficient number of students attending to justify the course.

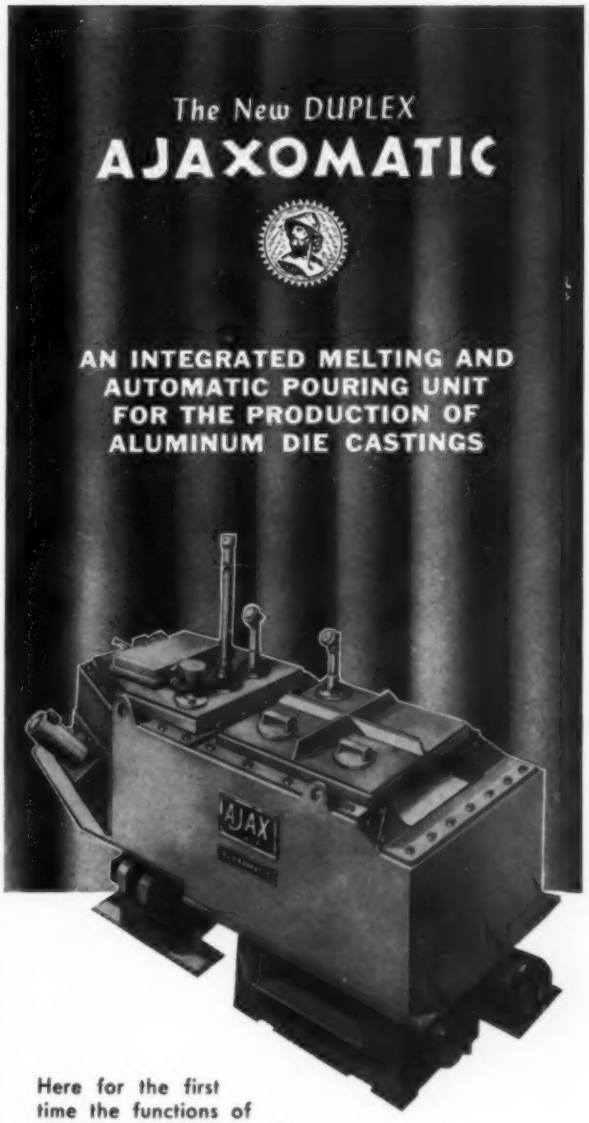
2. We have those in our schools who feel it is a waste of time and money to teach die casting. Their lack of interest and understanding makes them biased.

3. Many manufacturers are just waking up to the fact that die casting is not as expensive as it once was and that they now can get a much better product from die casting than from other processes. They are taking a second look at the Die Casting Industry and realizing its potentialities.

4. The SDCE and the DIE CASTING ENGINEER are bringing the Die Casting Industry to the foreground, putting it in a different light with greater understanding for the manufacturer. Where it was only a name before, it now has become a meaning, in fact, a reality in most cases.

5. Lastly, we, as members of the SDCE, by interesting the die casting companies in the benefit of having training courses in the field, will make them aware of the lack of training schools. The companies, in turn, putting pressure on the schools, could swing a great amount of weight and bring about a changed situation.

Until people become aware of die casting and its importance, nothing will be accomplished. We must interest young people in the field so that there will be a demand for classes. ■ ■ ■



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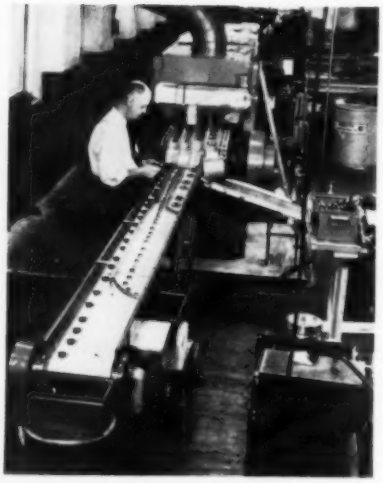
PRE-PLATE CLEANING

(Concluded from Page 11)



Automotive parts are cleaned in this washing machine. Note that different parts are treated simultaneously.

Photo courtesy Saco-Lowell Shops, Biddeford, Maine

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Lead

Direct current is recommended in the electrocleaning of lead and its alloys as the use of reverse current may attack the surface. The acid dip following cleaning should be either 5 to 15% fluoboric or 5 to 10% hydrochloric. Fluoboric is preferred as its salts are more soluble in water. Solutions used for the electrocleaning of lead should be changed frequently to limit the build-up of lead salts. Otherwise lead will plate out on the work as smut and interfere with plating.

Magnesium

The cleaning of magnesium before plating involves much the same processes as the cleaning of the other die cast metals. Like aluminum, magnesium must be given a zinc immersion coating. Unlike aluminum, it also demands pickling in a solution of chromic, concentrated nitric, and hydrofluoric acids, followed by a cold rinse, and activating in a solution of phosphoric acid and sodium, ammonium, or potassium acid fluoride.

So many factors enter into the electrocleaning of the various die cast metals that no one formula will suit every plater. It may be advisable to check with the metals manufacturers, the manufacturers of plating equipment, and the manufacturers of cleaning compounds. Their suggestions are based on the experiences of many plating shops, and they can save many trials and errors.

Meet the Author

JOHN C. RUTTLE is a member of the Detroit field staff of Oakite Products, Inc., pioneer manufacturers of metal cleaning and treating compounds. He received his education at Michigan State College.

When he isn't working in the metal plants of Detroit, or occupied with his three children at their home in Detroit, he's trying to shoot par golf on the local links.

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AUTOMATIC METERING OF MAGNESIUM

(Concluded from Page 13)

Shot weight is established by a simple turn of a control knob on the automatic timer and is infinitely adjustable between the 0.5 and 10 pound limits. After quickly establishing shot size at the start of a job, casting operations may be continuous even during periods of filling the holding pot. As the rate of flow of the molten magnesium through the valve varies with the pressure of the hydraulic head, a metal level sensor and compensating instrument correct the automatic metering timer to discharge uniform shot weights. Experience to date has shown a reproduction of shot weights up to about five per cent deviation over the total change in height of the metal in the holding pot. Figure 3 illustrates this uniformity of shot size by the small variations in biscuit lengths. Close control of casting biscuit size not only results in a savings by conserving casting alloy, but permits more rapid casting rates by assuring a uniform minimum solidification period and also removes the safety hazard of "exploded biscuits" upon die opening.

Installation of automatic metering equipment on a conventional cold chamber die casting machine is relatively simple and requires no fundamental machine changes. However, the machine must provide adequate shot injection speed for magnesium, which is usually greater than the shot injection speed for most aluminum alloys. Space must be provided opposite the operator on the injection end of the machine for the automatic metering equipment. The distance between the machine stationary platen and shot well filler opening must be sufficient for centering the metal valve over the pouring hole, and such injection end tie bars as may interfere with the transfer pipe must be relocated. The automatic feeding equipment can be easily set in place with a fork truck or overhead crane and final positioning made from adjustments provided in the pot support stand. All utilities and controls are provided with quick disconnects which require only a few minutes to connect or disconnect.

Early development work was plagued with untimely freezing or stoppage of some component of the automatic feeding mechanism, especially when casting operations were suspended for lunch periods or die changes. Also, dripping and

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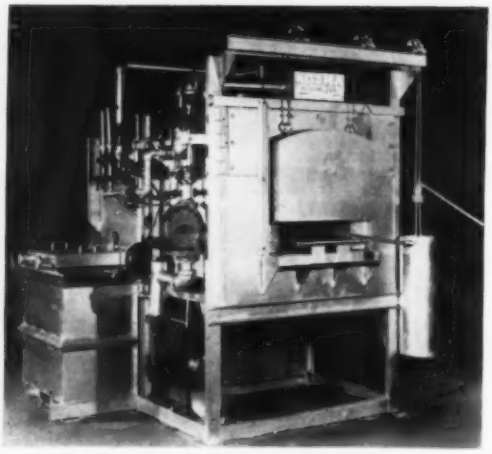

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dribbling of molten metal from the outlet following the discharge interval caused a nuisance problem and often resulted in suspending casting operations until the situation was corrected. The design of the described unit has eliminated these troublesome factors and reduced maintenance to a minimum. Servicing the automatic feeding mechanism is very simple. The valve stem is the only moving part operating in the molten metal, and it is designed to incur preferential wear. A valve stem can be replaced hot in 15 to 20 minutes with the metering unit in position on the machine. Other operating parts are principally electrical and require little maintenance.

An automatic metering mechanism for supplying magnesium to cold chamber die casting machines permits greatly increased casting rates by eliminating the conventional hand ladling operation, assuring part quality by controlling metal transfer conditions, reducing operator motions and fatigue and increasing current permissible shot weights. Simple installation permits flexible scheduling for casting various metals on the same machine. Minimum start up time, trouble free performance and low maintenance have been experienced in service. The automatic metering mechanism permits further economic advantages in the conversion of die cast parts to magnesium. ■ ■ ■

MEET THE AUTHORS

F. C. Bennett

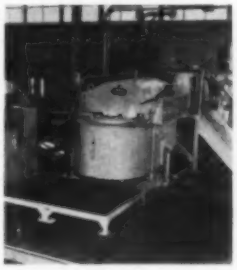
F. L. Burkett

Foster Bennett is Chief of Dow's metallurgical laboratory die casting section. He received his B.S. in Engineering Physics from the U. of Illinois, 1936, and his M.S. in Physics from Cal Tech, 1937. He has had many years of experience in developing metal reduction techniques and magnesium die casting methods.

Francis Burkett is Development and Research Engineer in Dow's metallurgical labs at Midland. He graduated from the G.M. Institute in math, chemistry, and metallurgy. Along with the metering system he has done considerable work in alloying magnesium for die casting.

NEWS of the INDUSTRY

LINDBERG-FISHER ANNOUNCES A NEW AND EFFICIENT ALUMINUM HOLDING UNIT



A completely new and efficient aluminum holding unit has been announced by the Lindberg-Fisher Division, Lindberg Engineering Company, Chicago, Illinois.

Heated by silicon carbide resistor elements, the furnace has been carefully engineered to maintain a relatively large bath of molten aluminum within close limits of casting temperatures, providing the operator with a supply of clean metal under ideal conditions. The furnace is charged at the rear through a charging well provided with a refractory skimming ledge to hold back any surface dross formation incurred through the pouring operation. The front of the furnace is equipped with a ladling well providing adequate room for correct ladling procedures.

3 CONVENIENT LOCATIONS TO SERVE YOU!

OWENS WELDING CO., Inc.
DETROIT, MICHIGAN

- PROMPT PICKUP & DELIVERY AT ALL 3 PLANTS
- SPECIALIZED WELDING OF ALL TOOLS & DIES
- Approved for Government Work Requiring Certificates

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PLANT 3
13807 Chadwick, Detroit 27
TE. 4-7575 West Side

ALL TYPES OF MOLD DIES A SPECIALTY
30 Years of Expert Welding Experience

Rex Farmer, President
Steve Novak, Vice President—Research
Adam Kalish, Vice President—Production
Kenneth Durr, Vice President—Sales

PEOPLE in DIE CASTING

George Griffenham leaves the SDCE, Meyer Tenenbaum succeeds him.

Norman Hill joins the Clifford-Rockwell Co.

George F. Griffenham has resigned as Executive Secretary of the SDCE. Forced to resign by pressing business matters, his resignation was regretfully accepted by the Board of Directors. Griffenham has been a guiding light in the Society since its inception.

Meyer R. Tenenbaum, Executive Treasurer of the SDCE, was chosen to succeed Griffenham in the post of Executive Secretary, combining the duties with those of his present post. Tenenbaum also is one of the leading figures in the Society.

Norman Hill, formerly of the Chrysler Corp., became associated with the Clifford-Rockwell Company as a sales representative on November 1.

Hill, a graduate of Wayne State University, lives in Warren, Michigan. He brings an extensive industrial background to the Clifford-Rockwell Company.

DIE CASTERS . . . *Here's Added Savings!*

D-M-E CAVITY SETS

IN 6 NEW STANDARD SIZES

Check these **NEW** *sizes..*

IN D-M-E No. 1 STEEL

$14\frac{7}{8}$" x $23\frac{3}{4}$"
$16\frac{1}{2}$" x $23\frac{3}{4}$"
$19\frac{1}{2}$" x $23\frac{3}{4}$"
$23\frac{3}{4}$" x $23\frac{3}{4}$"
$23\frac{3}{4}$" x $29\frac{1}{2}$"
$23\frac{3}{4}$" x $35\frac{1}{2}$"

STANDARD PLATE THICKNESSES FROM $\frac{7}{8}$" to $5\frac{7}{8}$"

ALL PLATES GROUND FLAT and SQUARE

Ready for your die layout and cavity inserts

Precision Ground LEADER PINS and BUSHINGS

For accurate alignment and longer wear

Write Today for . . .

D-M-E's 12 page Brochure giving Complete Prices and Specifications

DETROIT MOLD ENGINEERING CO.

6686 E. McNICHOLS ROAD — DETROIT 12, MICHIGAN — TWinbrook 1-1300

Contact Your Nearest Branch FOR FASTER DELIVERIES!

DME

HILLSIDE, N. J. (NEAR NEWARK) 1217 CENTRAL AVE., ELIZABETH 5-3500
CHICAGO 51, ILLINOIS 5901 W. DIVISION STREET, MANSFIELD 6-2900
CLEVELAND 9, O. - D-M-E CORP. 502 BROOKPARK RD., SHADYSIDE 1-9202
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-8214

John Lapin appointed SDCE committee chairman

John Lapin, Saginaw Bay Industries, has been appointed Chairman of the National Standards Committee of the SDCE to succeed **Meyer R. Tenenbaum.**

Lapin graduated from the University of Michigan with a Bachelor of Science in Chemical Engineering. First employed by Consumers Power Company, he later became associated with Dow Chemical Company. Since 1952, Mr. Lapin has been with Saginaw Bay Industries, Inc. as Chief Engineer.

Record catch for Jim Kux

James Kux (right), President of the Kux Machine Company, Chicago manufacturer of die casting machines, gets a handshake of congratulations from guide **Bobby Buswell** (left) and business associate **William Mann** (center) after catching a record 110 pound Tarpon in Tampa Bay, Florida.

Kux annually spends his vacation on the waters near Tampa fishing for Tarpon, and he has won many contests with record catches.

CLIFFORD-ROCKWELL COMPANY

METAL FINISHING MATERIALS

19364 James Couzens Hwy.

Detroit 35, Michigan

Diamond 1-8873

COMPOSITION MATERIALS CO., INC.

Crushed walnut shells, corn cobs, high grade sawdust and leather fibres for blasting, tumbling, metal finishing.

MIDWEST BUFF MFG. CO.

Cotton and Sisal buffs in bias, full disc, finger and specials. Polishing and contact wheels.

WARREN SALES CO., INC.

Vitrified and resinoid mounted points and wheels for deburring, snagging, and die-finishing.

DIE CASTING MACHINES

FOR SALE

4—**Gen. Motors,** 150 Tons, Zinc, 18½ x 18½ centers. rebuilt. New goosenecks & plungers many good features. From 3,500.00 to 5,000.00

1—**Kux BH-18,** Zinc 300 tons, rebuilt last year. 6,000.00

1—**Kux BH-30,** 1955, Zinc & Aluminum ends, Hydr. Eject. Pydraul fluid, incl. unit die holder Nearly new. Total price $23,000.00

3—**Cleveland** 400 Tons Aluminum, 1950. each 13,000.00

1—**Cleveland (G&N)** 400 Tons 1946, 5,500.00

1—**Lester HHP-3X,** Alum. 600 tons, just rebuilt and now in full production. Incl. zinc attachm. 13,500.00

1—**Cleveland #50,** 50 Tons, Zinc, little used, 1952, 5,500.00

1—**Kux BH-12,** Zinc 80 Tons, 1952 5,500.00

2—**B&T,** 400 Tons, Aluminum, 1953 & 1954

2—**Kux,** 500 Tons, Aluminum, 1949, ea. 14,500.00

1—**Standard,** 1000 tons Zinc, will convert to Alum. at extra cost. Practically unused Dies open 14". $18,000.00

1—**Reed-Prentice** 400 tons Al. 1950, 14,000.00

2—**Lake Erie,** 600 tons Zinc and Alum., 1953 like new 22,000.00

1—**Standard** 600 tons, Zinc, 1949 11,000.00

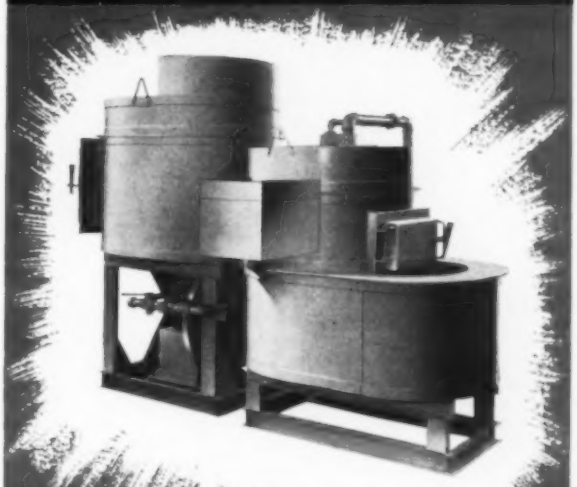
2—**Nitrogen flasks** 2000 psi. 28" dia. x 18 ft. long and 24" dia. x 13 ft. long. Tested by Lloyd.

MAGNESIUM INDUSTRIES INC.

1313 Kalamazoo St.

South Haven, Michigan. Tel. 1163

HERE'S ANOTHER NEW ONE!



Stroman "DC" Cylinder Type Furnaces for Combination Melting and Holding Aluminum with CONTAINED COMBUSTION BURNERS

For Die Casting, Permanent Mold and Sand Casting Operations

"Versatility Plus" is the keynote of these newest Stroman Contained Combustion Furnaces. They are absolutely new in design for they incorporate Contained Combustion Burners which eliminate direct flame impingement on the metal. They also make for cooler working conditions because of less heat loss. They give greater fuel economy for less BTU input is required . . . Longest refractory life and least maintenance due to mild combustion conditions . . . Uniform heating condition and improved metal temperature control assure lowest metal losses.

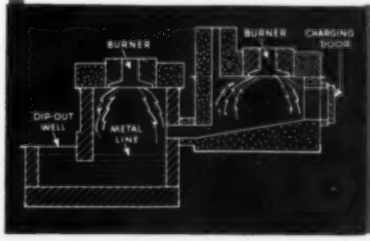
They are easy to charge and readily adaptable to automatic charging. Handling from 450 to 1600 lbs. per hour break down capacity with holding capacity from 600 to 2400 lbs., they will melt metal faster and more economically, and at the same time produce only the highest quality metal.

Roof of the furnaces are easily removed for furnace cleaning, relining, repair or burner service, as burner is mounted in the roof.

These Stroman "DC" Cylinder type furnaces are available in break down and holding combinations. However separate break down and holding units can be purchased. Break down units are often used to augment iron pot, electric and crucible furnace capacities.

Their flawless operation and ability to deliver years of trouble-free operation stamp them as a leading Stroman Aluminum production furnace. Investigate their cost cutting operation today.

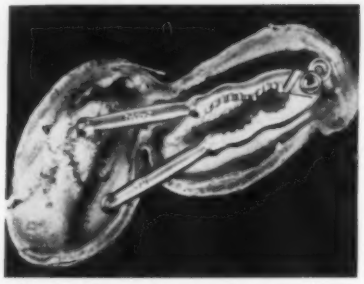
Send for complete new catalogue No. 150 just off the press.



STROMAN
FURNACE & ENGINEERING CO.
FRANKLIN PARK
ILLINOIS

NEWS of the INDUSTRY

Gries Produces Peanut Size Die Cast Nutcracker



Small enough to fit inside a peanut, the new "Intercast" nutcracker by Gries Reproducer Corp., New Rochelle, New York is the latest in the company's series of zinc alloy working minatures. All of them have moving parts, yet are "cast assembled" by GRC's unique die casting machines. No separate assembly or hand work is necessary. Even trimming off excess metal is handled by the machine, and the nutcrackers are ready to use as they come out.

The only limitation of the "Intercast" process is the size of the parts produced by this specialist in miniaturization: upper weight limit, 0.5 oz.; upper size limit, 1.5 in. There is no lower limit. GRC can die cast the smallest part that can be designed.

Samples of the nutcracker and a four-page folder describing the "Intercast" process are available from Department 193, Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N.Y.

"Design of Die Castings" Book Available

The American Foundrymen's Society has made available the book "Design of Die Castings" originally written by G. Lieby and published in German. The AFS has undertaken its translation and publication in English as a service to American die casters.

The book is available through the National Headquarters, American Foundrymen's Society, Golf and Wolf Roads, Des Plains, Illinois. Prices are: AFS members $5.25 per copy and non-members $8.00 per copy.

Shaw Process Die Casting School

The Shaw Development Corp., Port Washington, N.Y., in response to the article "Where Are the Educational Opportunities" by John R. Zurbrick, appearing in the September issue of the DIE CASTING ENGINEER, has sent us a photograph of its school for licensees in Port Washington. However, this school is open only to those people who are licensed to use the Shaw Process.

New Jersey Zinc Receives Marketing Award

The New Jersey Zinc Company's sales promotional activities in the Die Casting Industry received first prize in the 1957 American Metal Market Annual Marketing Awards. The Company's program was judged best in the copper, lead and zinc category.

The Company's die casting alloy promotional activities have been among the most progressive in the industry. Its extensive advertising in metalworking papers, its well known publication The Alloy Pot, its production and use of motion pictures and its participation in the furthering of die casting clinics throughout the country constitute the principle phases of its promotion.

R. G. Kenly (left), Vice President of The New Jersey Zinc Company, receives the certificate from Archer W. P. Trench, Publisher, American Metal Market, sponsor of the marketing awards.

New Booklet Illustrates Brush Plating

"Practical Brush Plating With the Dalic Process" is the title of a new booklet available upon request from the Marlane Development Company. It is based upon a paper by Marv Rubinstein, metal finishing consultant, which was presented at the technical proceedings of the 43rd annual convention of the American Electroplaters Society.

Subtitled "Some Recent Developments in Selective Localized Plating for Engineering Purposes," the booklet first explains the process and analyzes the metallurgical properties of the deposits. Then it devotes more than 8 pages to description of typical time-saving engineering applications.

The new 12 page booklet, extensively illustrated, is available upon request from Department 193, Marlane Development Company, 153 East 26th St., New York 10, N.Y.

Gries Reproducer Expands Facilities

Gries Reproducer Corp., New Rochelle, New York, a leading producer of miniature die castings and thermoplastic molded parts, is expanding its plant and production facilities to more than double their output. The building, only four years old, will receive a single-story, 50 ft. wide addition along its entire length, and another two story wing. The new expanded plant will contain over 150,000 sq. ft. of area.

The addition will primarily be utilized for the installation of badly needed production machinery and for storage, materials handling and shipping space. Last year the company turned out more than one billion parts, die cast or molded one at a time.

SUPREME IMPRESSION & MOLD CO., INC.

23080 GROESBECK HIGHWAY • EAST DETROIT, MICH.

PHONE PRescott 8-2200

Designers and Builders of Die Cast Dies Exclusively

Two Important Announcements on VACUUM DIE CASTING from REED-PRENTICE

REED Announces Exclusive Rights to Vacuum Die Casting

In an agreement just concluded with David Morganstern, Vice-President of Nelmor Manufacturing Company, Reed-Prentice has been granted sole rights to existing patents on vacuum die casting equipment. Mr. Morganstern will work with REED as a consultant.

Now you can get vacuum die casting equipment — for both zinc and aluminum, as either original equipment or conversion units — as a REED exclusive. Contact your Reed-Prentice Sales Engineer today for full details.

REED Announces A New Aluminum Vacuum Die Casting Unit

The Vacufeed, a new vacuum die casting system for aluminum, features fully automatic feeding. This new unit gives you, with aluminum, all the advantages of thinner, stronger castings already proved by the zinc Vacucast system. The new Vacufeed is now being run experimentally on a production basis, and full details will be announced soon.

Your Reed-Prentice Sales Engineer can give you data and preliminary specifications on the new aluminum Vacufeed unit. Contact him today, or write to our main office in Worcester.

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Affiliate of PACKAGE MACHINERY COMPANY

677 CAMBRIDGE STREET, WORCESTER 4, MASS.

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DIE CASTING INDUSTRY

Complete designing and engineering. Modern plant & equipment includes BG-21 4' x 6' & BL-3620 Keller Duplicators.

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BErkshire 7-0800

INDUSTRY

Branson Ultrasonic Introduces New Ultrasonic Generator

Branson Ultrasonic Corp., Stamford, Conn., has introduced a new size ultrasonic generator in its line of ultrasonic cleaning devices. The Sonogen model AP-25-B was designed for use with standard Branson tank-type or all welded stainless steel immersible transducers. It is ideal for unattended cleaning of small parts that must be dirt free before assembly, painting or plating. For cleaning-rinsing or other two step operations, the generator output can be switched easily between transducers mounted in separate tanks.

Rated r-f output of the 10 x 16 x 12 in. deep generator is 125 watts average power, with peak power on pulses of 500 watts.

ADVERTISERS INDEX

Dodge Custom-made Special Alloy Steel Goosenecks

. . . for longer service life
. . . less maintenance

Here's the biggest news in die casting in years: a custom-made special alloy *steel* gooseneck that will outlast and outperform iron and alloy iron goosenecks currently available . . . and provide greater operational savings! Developed through years of experience and association with the die castings industry, Dodge Special Alloy *Steel* Goosenecks provide many advantages:

- Will outlast iron and alloy iron goosenecks by as much as 4-5 years.
- Maintenance problems are fewer because of long service life.
- Down time is reduced to a minimum because of long service life.
- Designed and made of special alloy *steel*, they prevent cracking . . . bottom breakout . . . spout erosion.

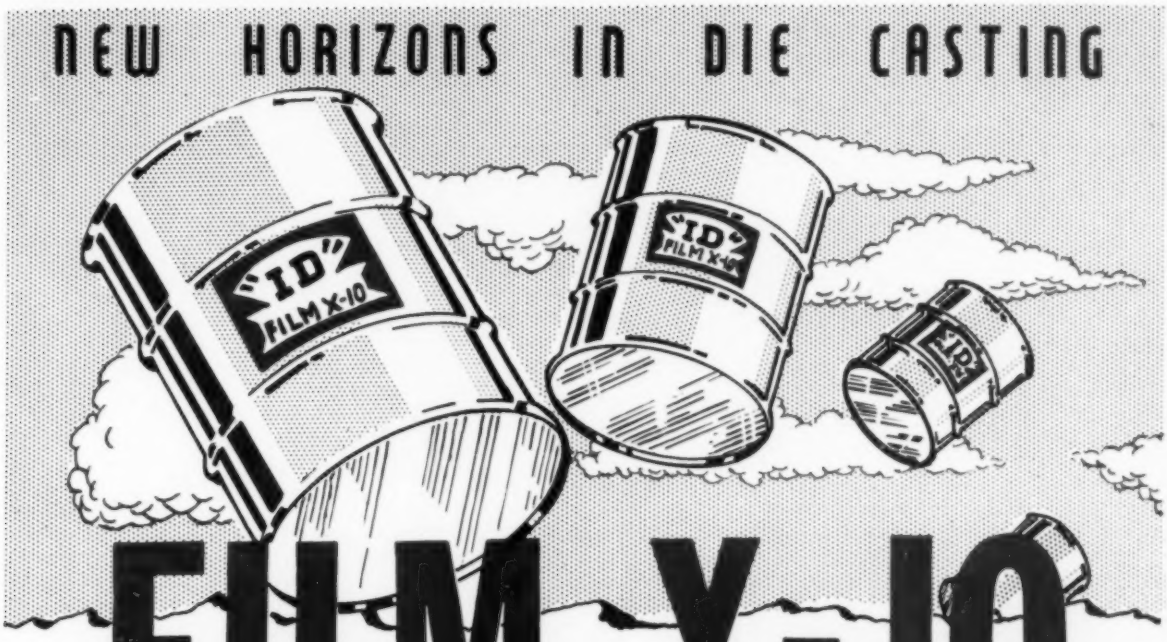
Each Dodge Special Alloy *Steel* Gooseneck is custom made to specifications by the Finished Products Division of Dodge Steel Company. Facilities are available for producing any size gooseneck for any die casting machine. Goosenecks are furnished either rough machined or machined with sleeves. Dodge provides a complete engineering service in the designing and production of steel goosenecks.

Your inquiries are solicited, without obligation, of course. Ask too, about pots and other die casting machine parts including nozzles, spouts, plungers, etc.

DODGE STEEL COMPANY
FINISHED PRODUCTS DIVISION
6501 Tacony Street
Philadelphia 35, Pa.

THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

NEW HORIZONS IN DIE CASTING



FILM X-10
DIE RELEASE

Die Casting "ID" Corporation, of California, was formed of Die Casters with many years experience, both at the machine and in lubrication engineering.

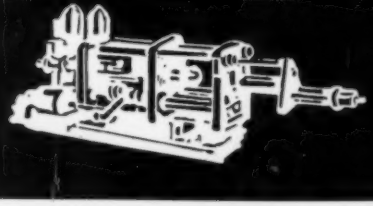
"ID" Corporation introduced its "NEW IDEAS" to the West Coast a year ago. Since that date we are happy to announce that our products are doing an excellent job and are now being accepted on the coast along with many of the regular "ole Timers" in this field.

One of the leaders in the field of "NEW IDEAS" is the product FILM X-10 Die Release. FILM X-10 is a concentrate, which the user reduces by one part of FILM X-10 to 15 or 20 parts of water. The reduced mixture is sprayed or brushed onto the die face. The "NEW IDEA" being, that the ability of flow of FILM X-10 sufficiently coats the die surface to insure the release of mineral deposits, which may be formed from tap waters. FILM X-10 insulates against uneven cooling, which prevents die check when a hot running die surface is rapidly cooled.

Send for free catalog

As our motto is "ALL PRODUCTS FOR DIE CASTERS DESIGNED BY DIE CASTERS," we would appreciate hearing from you, the "DIE CASTER," and trust that one of our fine products may help you solve only one of the many problems faced each day.

ALL INVOICES WILL BE CANCELLED
IF OUR PRODUCTS ARE NOT ENTIRELY SATISFACTORY
"FOB YOUR PLANT"



DIE CASTING "ID" CORPORATION
"ALL PRODUCTS FOR DIE CASTERS DESIGNED BY DIE CASTERS"
631 Bungalow, El Segundo, California
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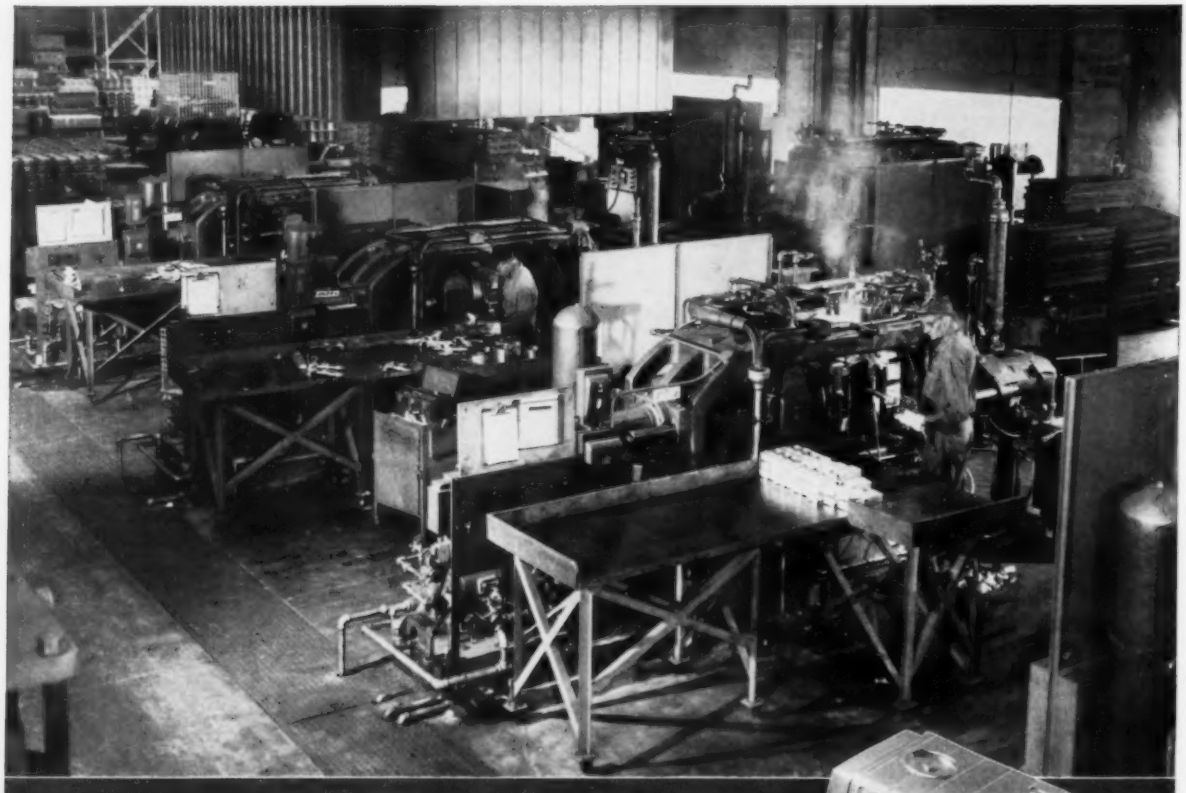
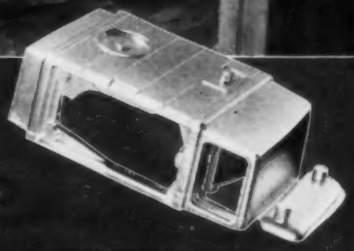


Now Bell and Howell... die casting on LESTERS...saves over 25% on this typical casting!



Bell and Howell Company, the only major photographic equipment manufacturer doing a major part of their own die casting, tell a story that is classic as a testimonial to the wisdom of installing Lester machines.

Mr. W. D. Johnson, Die Casting Manager of the company, has been working on the project since its inception, and was there when the first machines were installed—well over two years ago.

Speaking from this vantage point about the housing for their Monterey 8mm movie camera shown here, he says, "We had never done any die casting previous to our set-up of these machines a little over two years ago, and began production on this rather difficult casting on a high monthly requirement...This production schedule has continued since that time. *The savings to Bell and Howell on this particular casting have been well above the average savings of approximately 25% for the entire die casting operation."*

●

Complete details on the full line of Lester Die Casting Machines are available in Bulletin 101. *Write for your copy TODAY.*

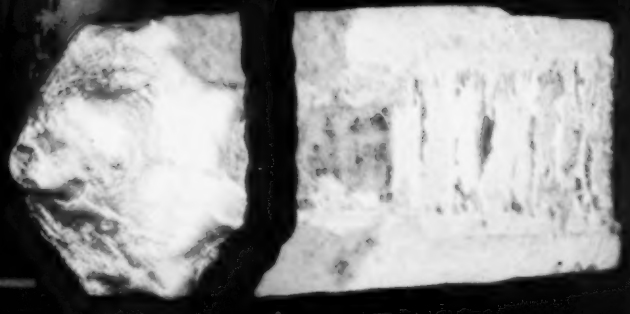
LESTER-PHOENIX, INC.

2716-5 CHURCH AVENUE • CLEVELAND 13, OHIO

Agents in principal cities throughout the world

THERMOLD AV

Die Casting Die Steel



Thermold AV

UNIVERSAL-CYCLOPS STEEL CORPORATION

Martin grinding and machine works, inc.

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